RECEIVED
CENTRAL FAX CENTER
MAY 0 5 2005

CERTIFICATE OF TRANSMISSION
I hereby certify that this 60-page correspondence is being facsimile transmitted to the Patent and Trademark Office - Fax No. (703) 872-9306

Date: May 5, 2005

Matthew J. Laskoski

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Kiril A. Pandelisev

Serial No. 09/881,104

Art Unit: 2878

Filed: June 15, 2001

Examiner: A. Gagliardi

For: FIBER OPTIC ENHANCED SCINTILLATOR DETECTOR

APPEAL BRIEF

PAGE 1/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

TABLE OF CONTENTS

PAGE 2/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

RECEIVED
CENTRAL FAX CENTER
MAY 05 2005

REAL PARTY IN INTEREST

PHOENIX SCIENTIFIC CORPORATION is the real party in interest in the above-identified case by virtue of an assignment filed June 15, 2001, and recorded on Reel/Frame 011906/0457.

PAGE 3/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

RELATED APPEALS AND INTERFERENCES

No other related appeals or interferences are pending at this time.

PAGE 4/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

STATUS OF CLAIMS

Claims 1-8, 10-12, 15, 23-32, 34-41, 43-45, 55-63, 65, 66 and 148-153 were finally rejected over prior art.

Claims 9, 13, 14, 16-22, 33, 42, 46-54, 64, 67-147 and 154-177 were withdrawn from consideration.

A copy of the appealed claims is appended hereto in the CLAIMS APPENDIX.

PAGE 5/80 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRP-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

STATUS OF AMENDMENTS

Amendments proposed after the final Office Action were not entered pursuant to an Advisory Action dated January 12, 2005.

PAGE 6/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

SUMMARY OF CLAIMED SUBJECT MATTER

The following is a summary of the claimed subject matter in independent claim 1 and its dependent claims.

Fiber optic enhanced scintillator apparatus comprising a scintillator 10 for producing photons upon being energized by particles, energy or rays (See, for example, Specification page 1, line 23 to page 2, line 15; Specification page 8, line 18 to page 9, line 12; and Figures 1 and 2), the scintillator 10 further comprising a scintillator body 11 made of scintillator material (See, for example, Specification page 4, lines 3 – 5; and Figures 1 and 2), surfaces on the body for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator (See, for example, Specification page 1, line 23 to page 2, line 15; Specification page 8, line 18 to page 9, line 12; and Figures 1 and 2), and a plurality of light-conducting distinct and elongated optical fibers 21, 23 having a proximal and a distal end (See, for example, Specification page 8, line 18 to page 9, line 12; Specification page 9, line 18 to page 10, line 3; and Figures 1 and 2), and wherein the proximal end of each fiber is optically coupled to the photon output (See, for example, Specification page 4, lines 1 – 2; Specification page 12, lines 14 – 20).

A photon detector connected to the distal end of each of the optical fibers (See, for example, Specification page 1, lines 14 – 19; Specification page 12, lines 1 – 13). The optical fibers 21, 23 are long for reducing dark current (See, for example, Specification page 9, lines 13 – 17). The scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator far below the earth's surface to the detector which is mounted above the earth's surface (See for example, Specification page 10, lines 4 – 7).

PAGE 7/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

The scintillator further comprises an optical coupler 13, 15 between the scintillator body and the output (See, for example, Specification page 10, lines 8 – 17; and Figure 2). The optical coupler further comprises an array of micro lenses 119 for directing photons from the scintillator body toward the output and the proximal end of the optical fibers (See, for example, Specification page 11, lines 7 – 10; Specification page 14, line 21 to page 15, line 9; and Figure 12). A second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of micro lenses in the second optical coupler for directing photons from a second part of the scintillator body to a second output, and further comprising second multiple optical fibers connected to the second output (See, for example, Specification page 12, lines 1 – 13). The first and second outputs and each of the second multiple optical fibers have distal ends connected to a single detector (See, for example, Specification page 12, lines 1 – 13).

An electronic cooler 53 connected to the detector (See, for example, Specification page 11, lines 11 – 21; Specification page 11, lines 22 – 24; and Figures 3 and 4). A magnetic field 55 shielding surrounding the detector and the cooler (See, for example, Specification page 11, lines 11 – 21; Specification page 11, lines 22 – 24; and Figures 3 and 4).

A second output and first and second elastomeric optical coupler bodies connected to the scintillator body at different portions thereof for delivering photons from the scintillator body to the outputs, and for cushioning vibrations and impacts encountered by the scintillator (See, for example, Specification page 10, lines 4 – 7; and Figure 1).

The scintillator further comprises at least one additional individual scintillator body wherein each additional body is comprised of scintillator material, surfaces for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator, a plurality of light-conducting optical fibers wherein each fiber has a proximal and a distal end and

PAGE 8/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

wherein the proximal end of each fiber is optically coupled to the photon output, and a holder for holding the scintillator bodies in an array (See, for example, Specification page 2, line 16 to page 3, line 2; Specification page 12, lines 1 – 13; and Figure 5).

A plurality of micro lenses connected to each additional scintillator body for coupling the body to the proximal ends of optical fibers (See, for example, Specification page 10, lines 8 – 17; Specification page 13, line 21 to page 14, line 2; Specification page 14, line 21 to page 15, line 9; Specification page 4, line 18 to page 5, line 2).

The optical couplers have square, polygonal, rectangular, oval or round cross-sections (See, for example, Specification page 12, line 21 to page 13, line 2; and Figure 7).

The scintillators are angularly related to an axial direction of the holder, and wherein the proximal end of each of the optical fibers is connected to at least one lateral edge of one of the scintillator bodies. (See, for example, Specification page 1, line 23 to page 2, line 15). The plurality of independent scintillators have square, polygonal, rectangular, oval, round cross-sections, or any other combination thereof (See, for example, Specification page 12, line 21 to page 13, line 2; and Figure 7). The angularly related plural independent scintillators have optical connectors at opposite side edges for connecting to first and second groups of optical fibers at opposite side edges of the plural bodies (See, for example, Specification page 1, line 23 to page 2, line 15).

The optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor (See, for example, Specification page 2, line 16 to page 3, line 2).

A space between the detectors is filled with an elastomer (See, for example, Specification page 4, lines 12 – 17).

PAGE 9/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

The following is a summary of the claimed subject matter in independent claim 34 and its dependent claims.

Fiber optic enhanced scintillator method, comprising providing a scintillator body made of scintillator material (See, for example, Specification page 4, lines 3 – 5; and Figures 1 and 2), providing surfaces on the body for directing photons toward a photon output (See, for example, Specification page 1, line 23 to page 2, line 15; Specification page 8, line 18 to page 9, line 12; and Figures 1 and 2), providing multiple light-conducting optical fibers having proximal and distal ends (See, for example, Specification page 8, line 18 to page 9, line 12; Specification page 9, line 18 to page 10, line 3; and Figures 1 and 2), connecting proximal ends of the optical fibers to the output for receiving photons from the output (See, for example, Specification page 4, lines 1 – 2; Specification page 12, lines 14 – 20), and producing photons upon a scintillator being energized by subatomic particles, energy or rays (See, for example, Specification page 1, line 23 to page 2, line 15; Specification page 8, line 18 to page 9, line 12; and Figures 1 and 2).

Connecting a photon detector to the distal ends of the single or multiple optical fibers (See, for example, Specification page 1, lines 14 – 19; Specification page 12, lines 1 – 13). The optical fibers as long optical fibers, and reducing dark current with the long optical fibers (See, for example, Specification page 9, lines 13 – 17). Ruggedizing the scintillator for use far below an earth's surface, mounting the detector on the earth's surface, extending the optical fibers from the scintillator far below the earth's surface to the detector which is on the earth's surface, and transmitting photons from the scintillator through the optical fibers to the detector (See for example, Specification page 10, lines 4 – 7).

Providing an optical coupler between the scintillator body and the output (See, for example, Specification page 10, lines 8 – 17; and Figure 2). Providing an array of micro lenses

PAGE 10/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

on the optical coupler, and directing photons from the scintillator body through the micro lenses and toward the output and the proximal ends of the single or multiple optical fibers (See, for example, Specification page 11, lines 7 – 10; Specification page 14, line 21 to page 15, line 9; and Figure 12). Providing a second optical coupler, and providing a second photon output on the scintillator body remote from the first optical coupler, and providing a second array of micro lenses on the second optical coupler, directing photons from a second part of the scintillator body to the second output, and providing second single or multiple optical fibers having proximal ends connected to the second output (See, for example, Specification page 12, lines 1 – 13). Connecting distal ends of the first and second multiple optical fibers to a single detector (See, for example, Specification page 12, lines 1 – 13).

Connecting an electronic cooler 53 to the detector (See, for example, Specification page 11, lines 11 – 21; Specification page 11, lines 22 – 24; and Figures 3 and 4). Surrounding the detector and the cooler with a magnetic field shielding 55 (See, for example, Specification page 11, lines 11 – 21; Specification page 11, lines 22 – 24; and Figures 3 and 4).

Providing plural individual scintillator bodies, providing a holder connected to the scintillator bodies, holding the plural scintillator bodies in an array, and connecting proximal ends of the single or multiple optical fibers to each of the plural individual scintillator bodies (See, for example, Specification page 10, lines 4 – 7; and Figure 1).

Providing plural micro lens arrays on the plural scintillator bodies, and directing photons from the plural scintillator bodies through the plural micro lens arrays to the proximal ends of the optical fibers (See, for example, Specification page 10, lines 8 – 17; Specification page 13, line 21 to page 14, line 2; Specification page 14, line 21 to page 15, line 9; Specification page 4, line 18 to page 5, line 2).

PAGE 11/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

The plural scintillator bodies are provided with square, polygonal, rectangular, oval or round cross-sections (See, for example, Specification page 12, line 21 to page 13, line 2; and Figure 7).

The providing of the plural scintillator bodies comprises providing a plurality of independent scintillators, angularly relating the independent scintillators to each other, and connecting the proximal ends of the optical fibers to lateral edges of the angularly related independent scintillator bodies (See, for example, Specification page 1, line 23 to page 2, line 15). The plural of scintillator bodies are provided with square, polygonal, rectangular, oval or round cross-sections (See, for example, Specification page 12, line 21 to page 13, line 2; and Figure 7). Providing optical connectors at opposite side edges of the angularly related plural scintillator bodies, and connecting the optical fibers to the optical connectors at the opposite side edges of the plural bodies (See, for example, Specification page 1, line 23 to page 2, line 15).

PAGE 12/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729308 * CSID:703 448 7397 * DURATION (mm-ss):18-44

GROUNDS OF REJECTION

Claims 148-150 and 152-153 stand rejected under 35 U.S.C. 112, first paragraph as containing subject matter not supported by the original disclosure.

Claims 3-4, 55-63, 148 and 151-152 stand rejected under 35 U.S.C. 112, second paragraph as failing to particularly point out and distinctly claim the subject matter the Applicant regards as the invention.

Claims 1-6, 10-12, 34-39, 43-45, 65, 66, 148 and 153 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714).

Claims 7-8, 40-41 and 149-150 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Bourdinaud (U.S. Patent No. 5,103,099).

Claims 15 and 48 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Bourdinaud (U.S. Patent No. 5,103,099) and further in view of Meisner (U.S. Patent No. 4,904,865).

Claims 23-24 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961).

Claims 25-27 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961) and further in view of Kaufman (U.S. 2002/00870079 A1).

PAGE 13/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 28-32 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961) and further in view of Kaufman (U.S. 2002/00870079 A1), and further in view of Bourdinaud (U.S. Patent No. 5,103,099).

PAGE 14/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

ARGUMENTS

Allowance of all claims is requested. All of the claims distinguish the invention from the references.

Claims 148-150 and 152-153 are patentable under 35 U.S.C. 112, first paragraph as containing subject matter supported by the original disclosure.

The 35 U.S.C. 112, first paragraph rejections should be withdrawn. The Applicant's specification would reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention.

It is clear in the application that the Applicant is referring to down-hole deep oil well ruggedized scintillators for use while drilling. For example, see page 13, lines 13 – 20. The specification adequately indicates that the Applicant had possession of the invention at the time of filing.

Furthermore, optical couplers 33 and 35 are described on page 10 and on the next to bottom line of page 9 and are materials that connect optical devices, such as the scintillators to the fibers. This is adequately disclosed in the specification such that one skilled in the relevant art that the inventor, at the time the application was filed, would know that the Applicant had possession of the claimed invention.

Therefore, the rejections under 35 U.S.C. 112, first paragraph should be withdrawn.

PAGE 15/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 3-4, 55-63, 148 and 151-152 are patentable under 35 U.S.C. 112, second paragraph because they particularly point out and distinctly claim the subject matter the Applicant regards as the invention.

The 35 U.S.C. 112, second paragraph rejections should be withdrawn. The claims are not indefinite because they particularly point out and distinctly claim the subject matter that the Applicant regards as the invention.

The Examiner claims that "long", in claim 3, is a relative term and unclear. However, the specification expressly defines the term "long". For example, the specification identifies and describes fibers, as in claim 3, that are sufficiently long such that the fibers reduce dark currents. (See specification on page 9, lines 13 – 17).

The Examiner also claims that the phrase "the scintillator is ruggedized for use far below an earth surface", in claims 4 and 148, is indefinite. However, the specification describes ruggedized construction for use in oil wells far below an earth surface are described in detail. (See, for example, Figures 8 and 11 and specification page 13, lines 13 – 20 and page 14, lines 3 – 11). Once again, the specification provides adequate description of the proper scope of the word "far" that would particularly point out and distinctly claim the subject matter of the Applicant's invention.

Claims 55 – 63 are not indefinite. There is sufficient antecedent basis for the limitation "the single or multiple optical fibers" in claim 55. Claim 55 is dependent on claim 34. Claim 34 recites the limitation providing "multiple light-conducting optical fibers". Thus, there is proper antecedent basis for the optical fibers in claim 55.

Claims 151 – 152 are not indefinite. There is sufficient antecedent basis for the limitation "a space between the detectors is filled" in claim 151. Claim 151 depends on claim 24, which in

PAGE 16/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729308 * CSID:703 448 7397 * DURATION (mm-ss):18-44

turn depends on claim 1. Claim 1 is a fiber optic enhanced scintillator apparatus where photons are directed out and then received and conducted. The detectors are associated with the receiving apparatus. Thus, there is proper antecedent basis for the optical fibers in claim 151.

Therefore, the rejection based on 35 U.S.C. 112, second paragraph should be withdrawn.

PAGE 17/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

The present claims are patentable under 35 U.S.C. 103.

In considering the patentability of the present invention, it is requested that the Board consider the invention as a whole, consider the scope and content of the prior art as a whole, consider the differences between the claims at issue and the prior art, and consider the level of ordinary skill in the art to which the invention pertains at the time the invention was made. Graham v. John Deere Co., 148 USPQ 459, 467 (1966).

THE INVENTION AS A WHOLE

The invention considered as a whole is best described by the appended claims.

PRIOR ART AS A WHOLE

The prior art to which the invention pertains is typified by the references of record.

DIFFERENCES BETWEEN THE INVENTION AND THE PRIOR ART

Each of the present claims defines unique features and each is individually patentable over the prior art.

The test in reviewing rejections under 35 U.S.C. 103 in which the examiner has relied on teachings of several references, is whether references, viewed individually and collectively, would have suggested claimed invention to a person possessing ordinary skill in the art, and citing references which merely indicate that isolated elements and/or features recited in the claims are known is not a sufficient basis for concluding that combination of the claimed elements would have been obvious. Ex parte Hiyamizu, 10 USPQ2d 1393-1395 (Board of

PAGE 18/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Patent Appeals and Inter., 1988); In re Kaslow, 217 USPQ 1089 (Fed. Cir. 1983); In re Deminski, 230 USPQ 313 (Fed. Cir. 1986).

Claims 1-6, 10-12, 34-39, 43-45, 65, 66, 148 and 153 are patentable under 35 U.S.C. 103(a) as being non-obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 1 is patentable over Reed in view of Attix. Claim 1 teaches a fiber optic enhanced scintillator apparatus, comprising a scintillator for producing photons upon being energized by particles, energy or rays, the scintillator further comprising a scintillator body made of scintillator material, surfaces on the body for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator, and a plurality of light-conducting distinct and elongated optical fibers having a proximal and a distal end, and wherein the proximal end of each fiber is optically coupled to the photon output. These patentable features are not found in the cited references.

Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an

PAGE 19/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

"It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In re Fritch, 23 USPQ2d 1783, 1784 (CAFC, August 1992), quoting from In re Gorman, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

Citing In re Gordon, 221 USPQ, 1127, the court pointed out, "the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification". In re Fritch, 23

PAGE 20/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

USPQ2d 1783, 1784 (CAFC, August 1992). In the same case, In re Gordon, the court found a proposed modification inappropriate for an obviousness inquiry when the modification rendered the prior art reference inoperable for its intended purpose.

In In re Jones, 21 USPQ2d 1941 (Fed. Cir. 1992), the Court reversed the Examiner's obviousness holding because there was no suggestion, either within the references nor in the knowledge generally available to onc of ordinary skill in the art, to arrive at the claimed invention. Also the Court pointed out:

> "Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill in the art would have been motivated to make the necessary modifications of the prior art ... to arrive at the claimed ... [invention]" (emphasis supplied). In re Jones, 21 USPQ2d 1941, 1944 (Fed. Cir. 1992).

Claim 1 is patentable over Reed in view of Attix.

Claim 2 is patentable over Reed in view of Attix.

Claim 2 adds patentable features to claim 1, namely, a photon dctector connected to the distal end of each of the optical fibers. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 3 is patentable over Reed in view of Attix.

Claim 3 adds patentable features to claim 2, which is dependent on claim 1, namely, that the optical fibers are long for reducing dark current. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 21/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 4 is patentable over Reed in view of Attix.

Claim 4 adds patentable features to claim 1, namely, that the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator far below the earth's surface to the detector that is mounted above the earth's surface. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 5 is patentable over Reed in view of Attix.

Claim 5 adds patentable features to claim 1, namely, that the scintillator further comprises an optical coupler between the scintillator body and the output. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 6 is patentable over Reed in view of Attix.

Claim 6 adds patentable features to claim 5, which is dependent on claim 1, namely, that the optical coupler further comprises an array of micro lenses for directing photons from the scintillator body toward the output and the proximal end of the optical fibers. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 10 is patentable over Reed in view of Attix.

PAGE 22/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 10 adds patentable features to claim 2, which is dependent on claim 1, namely, an electronic cooler connected to the detector. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 11 is patentable over Reed in view of Attix.

Claim 11 adds patentable features to claim 10, which is dependent on claim 1, namely, a magnetic field shielding surrounding the detector and the cooler. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 12 is patentable over Reed in view of Attix.

Claim 12 adds patentable features to claim 2, which is dependent on claim 1, namely, an electromagnetic field shielding surrounding the detector. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 34 is patentable over Reed in view of Attix.

Claim 34 is patentable over Reed in view of Attix. Claim 34 teaches a fiber optic enhanced scintillator method, comprising providing a scintillator body made of scintillator material, providing surfaces on the body for directing photons toward a photon output, providing multiple light-conducting optical fibers having proximal and distal ends, connecting proximal ends of the optical fibers to the output for receiving photons from the output, and producing

PAGE 23/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

photons upon a scintillator being energized by subatomic particles, energy or rays. These patentable features are not found in the cited references.

Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

PAGE 24/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 34 is patentable over Reed in view of Attix.

Claim 35 is patentable over Reed in view of Attix.

Claim 35 adds patentable features to claim 34, namely, connecting a photon detector to the distal ends of the single or multiple optical fibers. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 36 is patentable over Reed in view of Attix.

Claim 36 adds patentable features to claim 35, which is dependent on claim 34, namely, providing the optical fibers as long optical fibers, and reducing dark current with the long optical fibers. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 37 is patentable over Reed in view of Attix.

Claim 37 adds patentable features to claim 34, namely, ruggedizing the scintillator for use far below an earth's surface, mounting the detector on the earth's surface, extending the optical fibers from the scintillator far below the earth's surface to the detector which is on the earth's surface, and transmitting photons from the scintillator through the optical fibers to the detector. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 38 is patentable over Reed in view of Attix.

PAGE 25/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 38 adds patentable features to claim 34, namely, providing an optical coupler between the scintillator body and the output. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 39 is patentable over Reed in view of Attix.

Claim 39 adds patentable features to claim 38, which is dependent on claim 34, namely, providing an array of micro lenses on the optical coupler, and directing photons from the scintillator body through the micro lenses and toward the output and the proximal ends of the single or multiple optical fibers. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 43 is patentable over Reed in view of Attix.

Claim 43 adds patentable features to claim 35, which is dependent on claim 34, namely, connecting an electronic cooler to the detector. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 44 is patentable over Reed in view of Attix.

Claim 44 adds patentable features to claim 43, which is dependent on claim 34, namely, surrounding the detector and the cooler with a magnetic field shielding. This is not obvious from Reed, Attix or any combination thereof.

PAGE 26/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 45 is patentable over Reed in view of Attix.

Claim 45 adds patentable features to claim 35, which is dependent on claim 34, namely, surrounding the detector with an electromagnetic field shielding. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 65 is patentable over Reed in view of Attix.

Claim 65 adds patentable features to claim 34, namely, connecting a detector to the distal ends of the optical fibers and cooling the detector with an electronic cooler surrounding the detector. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 66 is patentable over Reed in view of Attix.

Claim 66 adds patentable features to claim 65, which is dependent on claim 34, namely, shielding the detector from magnetic fields by surrounding the detector with magnetic field shielding. This is not obvious from Reed, Attix or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 148 is patentable over Reed in view of Attix.

Claim 148 adds patentable features to claim 1, namely, that the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator below

PAGE 27/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

the earth's surface to the detector which is mounted below the earth's surface and at a depth that minimizes the mechanical shock and a the temperature effects on the photosensor. This is not obvious from Reed, Attix or any combination thereof.

This is not a mere design choice. Nothing in Reed suggests this feature of Applicant's invention.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 153 is patentable over Reed in view of Attix.

Claim 153 adds patentable features to claim 34, namely, that the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator below the earth's surface to the detector which is mounted below the earth's surface and at a depth that minimizes the mechanical shock and a the temperature effects on the photosensor. This is not obvious from Reed, Attix or any combination thereof.

This is not a mere design choice. Nothing in Reed suggests this feature of Applicant's invention.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 28/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 7-8, 40-41 and 149-150 are patentable under 35 U.S.C. 103(a) as being non-obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Bourdinaud (U.S. Patent No. 5,103,099).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 7 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claim 1 is patentable over Reed and Attix as described above. Claim 7 is ultimately dependent on claim 1 and adds patentable features to claim 1, namely, a second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of micro lenses in the second optical coupler for directing photons from a second part of the scintillator body to a second output, and further comprising second multiple optical fibers connected to the second output. These patentable features are not found in the cited references. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

As described above, Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an

PAGE 29/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

The Examiner has cited Bourdinaud as suggesting a second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of microlenses in the optical coupler for directing photons from a second part of the scintillator body to a second output and further comprising second optical fibers connected to the second output.

Bourdinaud has a thin plate 2 of scintillating material that receives radiation through one edge 8, and has fluorescent fibers 4 attached longitudinally along the plate. The fluorescent fibers 4 have portions 6 which are parallel, adjacent and attached to one of the two faces of the

PAGE 30/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

plate. The fluorescent fibers are excited by light on the plate.

No combination of Bourdinaud and Reed or Attix should be made. The law is replete with holdings that an Examiner may not pick elements from references and combine them without some suggestion for their combination arising in the references themselves. The decision to combine various aspects of different references would not have been a matter of "routine design choice" as suggested by the Examiner.

Bourdinaud and Reed would have been mutually exclusive because Bourdinaud uses fluorescing cores in fibers to auto-generate wavelengths after a thin scintillator plate receives radiation at its end. Nothing in Bourdinaud would have suggested combination with Reed.

Even if the references were so combined, both of the references lead away from the invention as specifically set forth in the claims. Bourdinaud's fluorescent fibers, excited by light from one side of the scintillator plate, have nothing to do with Reed or Attix or with the present invention.

Nothing in the references, either singly or in combination, teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 1 is patentable over Reed in view of Attix and further in view of Bourdinaud.
Claim 8 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claims 8 adds patentable features to claim 7, namely, that the first and second outputs and each of the second multiple optical fibers have distal ends connected to a single detector. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 31/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 40 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claim 34 is patentable under the same rationale as claim 1 discussed above. Claim 40 adds patentable features to claim 39, which is dependent on claim 34, namely, providing a second optical coupler, and providing a second photon output on the scintillator body remote from the first optical coupler, and providing a second array of micro lenses on the second optical coupler, directing photons from a second part of the scintillator body to the second output, and providing second single or multiple optical fibers having proximal ends connected to the second output. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 41 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claim 41 adds patentable features to claim 40, which is dependent on claim 34, namely, connecting distal ends of the first and second multiple optical fibers to a single detector. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 149 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claim 149 adds patentable features to claim 5, which is dependent on claim 1, namely, that the optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 32/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 150 is patentable over Reed in view of Attix and further in view of Bourdinaud.

Claim 150 adds patentable features to claim 5, which is dependent on claim 1, namely, that the optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor. This is not obvious from Reed, Attix, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 33/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 15 and 48 are patentable under 35 U.S.C. 103(a) as being non-obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Bourdinaud (U.S. Patent No. 5,103,099) and further in view of Meisner (U.S. Patent No. 4,904,865).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 15 is patentable over Reed in view of Attix and further in view of Bourdinaud and further in view of Meisner.

Claim 1 is patentable over Reed and Attix and Bourdinaud as described above. Claim 15 adds patentable features to claim 1, namely, a second output and first and second elastomeric optical coupler bodies connected to the scintillator body at different portions thereof for delivering photons from the scintillator body to the outputs, and for cushioning vibrations and impacts encountered by the scintillator. These patentable features are not found in the cited references. This is not obvious from Reed, Attix, Bourdinaud, Meisner or any combination thereof.

The combination of four separate references to find obviousness seems excessive. The Applicant believes that the Examiner's need to use so many references just to assemble the Applicant's invention in hindsight renders the Applicant's invention non-obvious.

As described above, Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an

PAGE 34/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

The Examiner has cited Bourdinaud as suggesting a second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of microlenses in the optical coupler for directing photons from a second part of the scintillator body to a second

PAGE 35/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

output and further comprising second optical fibers connected to the second output.

Bourdinaud has a thin plate 2 of scintillating material that receives radiation through one edge 8, and has fluorescent fibers 4 attached longitudinally along the plate. The fluorescent fibers 4 have portions 6 which are parallel, adjacent and attached to one of the two faces of the plate. The fluorescent fibers are excited by light on the plate.

No combination of Bourdinaud and Reed or Attix should be made. The law is replete with holdings that an Examiner may not pick elements from references and combine them without some suggestion for their combination arising in the references themselves. The decision to combine various aspects of different references would not have been a matter of "routine design choice" as suggested by the Examiner.

Bourdinaud and Reed would have been mutually exclusive because Bourdinaud uses fluorescing cores in fibers to auto-generate wavelengths after a thin scintillator plate receives radiation at its end. Nothing in Bourdinaud would have suggested combination with Reed.

Even if the references were so combined, both of the references lead away from the invention as specifically set forth in the claims. Bourdinaud's fluorescent fibers, excited by light from one side of the scintillator plate, have nothing to do with Reed or Attix or with the present invention.

Meisner has a photomultiplier within the drill head and sends electrical signals to the surface. Meisner suggests placing a photomultiplier tube in the drill head. This is contrary to the Applicant's invention and would thus lead away from the invention, and would thus lead away from combination with the other references. There is no motivation to combine Meisner with the other cited references.

Nothing in the references, either singly or in combination, teaches or suggests the

PAGE 36/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 1 is patentable over Reed in view of Attix and further in view of Bourdinaud and further in view of Meisner.

Claim 48 is patentable over Reed in view of Attix and further in view of Bourdinaud and further in view of Meisner.

Claim 48 has been withdrawn from consideration as indicated in the Advisory Action dated January 12, 2005. However, the Examiner has argued claim 48 in the final Office Action dated June 7, 2004. For the sake of completeness, the Applicant will argue claim 48.

Claim 34 is patentable under the same rationale as claim 1 discussed above. Claim 48 adds patentable features to claim 34, namely, providing elastomeric optical coupler bodies and photon outputs on the scintillator body at opposite portions thereof, delivering photons from the scintillator body to outputs, and cushioning vibrations and impacts encountered by the scintillator with the elastomeric optical coupler bodies. This is not obvious from Reed, Attix, Bourdinaud, Meisner or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 37/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 23-24 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 23 is patentable over Reed in view of Attix and further in view of Inaba.

Claim 1 is patentable over Reed and Attix as described above. Claim 23 adds patentable features to claim 1, namely, that the scintillator further comprises at least one additional individual scintillator body wherein each additional body is comprised of scintillator material, surfaces for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator, a plurality of light-conducting optical fibers wherein each fiber has a proximal and a distal end and wherein the proximal end of each fiber is optically coupled to the photon output, and a holder for holding the scintillator bodies in an array. These patentable features are not found in the cited references. This is not obvious from Reed, Attix, Inaba or any combination thereof.

As described above, Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

PAGE 38/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

The Examiner has cited Inaba as suggesting additional scintillator bodies. However, Inaba has a scintillator probe for insertion in a fine tube in a body cavity of a living animal (See Column 1, lines 62 – 64) to detect cancer. Inaba's thin scintillator for use in a thin tube in an animal body cavity has no relation with Reed or Attix. Therefore, there is no motivation for combination with Reed or Attix.

PAGE 39/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

No combination of Inaba and Reed or Attix should be made. The law is replete with holdings that an Examiner may not pick elements from references and combine them without some suggestion for their combination arising in the references themselves. The decision to combine various aspects of different references would not have been a matter of "routine design choice" as suggested by the Examiner.

Nothing in the references, either singly or in combination, teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 1 is patentable over Reed in view of Attix and further in view of Inaba.

Claim 24 is patentable over Reed in view of Attix and further in view of Inaba.

Claim 24 adds patentable features to claim 23, which is dependent on claim 1, namely, a plurality of micro lenses connected to each additional scintillator body for coupling the body to the proximal ends of optical fibers. This is not obvious from Reed, Attix, Inaba or any combination thereof.

This is not a mere design choice. Nothing in the references suggest this feature of Applicant's invention.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 40/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 25-27 are patentable under 35 U.S.C. 103(a) as being non-obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961) and further in view of Kaufman (U.S. 2002/00870079 A1).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 25 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman.

Claim 1 is patentable over Reed and Attix and Inaba as described above. Claim 25 adds patentable features to claim 24, which is dependent on claim 1, namely, that the holder is flexible. These patentable features are not found in the cited references. This is not obvious from Reed, Attix, Inaba, Kaufman or any combination thereof.

The combination of four separate references to find obviousness seems excessive. The Applicant believes that the Examiner's need to use so many references just to assemble the Applicant's invention in hindsight renders the Applicant's invention non-obvious.

As described above, Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

PAGE 41/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

The Examiner has cited Inaba as suggesting additional scintillator bodies. However, Inaba has a scintillator probe for insertion in a fine tube in a body cavity of a living animal (See Column 1, lines 62 – 64) to detect cancer. Inaba's thin scintillator for use in a thin tube in an animal body cavity has no relation with Reed or Attix. Therefore, there is no motivation for combination with Reed or Attix.

PAGE 42/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

No combination of Inaba and Reed or Attix should be made. The law is replete with holdings that an Examiner may not pick elements from references and combine them without some suggestion for their combination arising in the references themselves. The decision to combine various aspects of different references would not have been a matter of "routine design choice" as suggested by the Examiner.

Kaufman has a delay line 42 in a catheter that sends electrical signals to a proximal end. Kaufman places a catheter in body lumen next to radioactively labeled regions. Kaufman has a delay line 42 in the catheter head which sends electrical signals to a signal processor outside the catheter, and thus would have lead away from the present invention even had it been combined with Reed. There is absolutely nothing in Kaufman, Reed, Attix, or Inaba that would have suggested their mutual combination in a manner proposed by the Examiner.

Nothing in the references, either singly or in combination, teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 1 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman.

Claim 26 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman.

Claim 26 adds patentable features to claim 24, which is dependent on claim 1, namely, that the holder is resilient. This is not obvious from Reed, Attix, Inaba, Kaufman or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 43/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claim 27 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman.

Claim 27 adds patentable features to claim 24, which is dependent on claim 1, namely, that the holder is elongated and flexible and the plural scintillator bodies are arranged axially in the holder. This is not obvious from Reed, Attix, Inaba, Kaufman or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 44/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

Claims 28-32 stand rejected under 35 U.S.C. 103(a) as being obvious over Reed (U.S. Patent No. 5,313,065) in view of Attix (U.S. Patent No. 5,006,714) and further in view of Inaba (U.S. Patent No. 5,331,961) and further in view of Kaufman (U.S. 2002/00870079 A1), and further in view of Bourdinaud (U.S. Patent No. 5,103,099).

The present claims particularly point out new and unobvious features of the invention which are not found in any reference and which would not have been obvious from the references. Nothing in each of the references teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 28 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 1 is patentable over Reed and Attix and Inaba and Kaufman as described above. Claim 28 adds patentable features to claim 23, which is dependent on claim 1, namely, a plurality of optical couplers provided on sides of the scintillator bodies, wherein each optical coupler couples the proximal end of an optical fiber to a scintillator body. These patentable features are not found in the cited references. This is not obvious from Reed, Attix, Inaba, Kaufman, Bourdinaud or any combination thereof.

The combination of five separate references to find obviousness seems excessive. The Applicant believes that the Examiner's need to use so many references just to assemble the Applicant's invention in hindsight renders the Applicant's invention non-obvious.

As described above, Reed teaches a fiber optic radiation monitor with a scintillating optical fiber 20. The scintillating optical fiber has aligned sections, dichroic mirrors 22 and an

PAGE 45/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

extension fiber 40, but does not have a single fiber or multiple fibers optically coupled to a scintillator.

Reed does not have the structure as described in the claims of the application. The single optic extension fiber of Reed is attached as a continuation of a scintillating fiber. Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror.

Therefore, Reed does not have fibers connected to a scintillator, does not have photocouplers, and does not have coupling lens arrays as described in the Applicant's claims.

The Examiner has cited Attix as teaching a light conducting means formed from a plurality of fibers. However, there would have been no motivation inherent in Reed or Attix to combine one with the other. It is requested that any rejection based on a combination of Reed and Attix be withdrawn.

Any attempt to modify the teachings of Reed by adapting Attix's multiple fiber optic bundle, as done in hindsight reconstruction by the Examiner, will do harm to the Reed device, because Reed expressly teaches a single fiber for conducting light. The bundle of optical fibers found in Attix does not correspond to the single fiber in Reed. As stated above, Reed has an extension fiber 40 and several sections of the scintillating fiber 20 with dichroic mirrors 22 disposed between each individual dichroic mirror. This is not true for Attix. Contrary to the Examiner's contention, merely because the references each teach scintillator detection devices does not necessitate a combination of the references.

The Examiner has cited Inaba as suggesting additional scintillator bodies. However, Inaba has a scintillator probe for insertion in a fine tube in a body cavity of a living animal (See Column 1, lines 62 – 64) to detect cancer. Inaba's thin scintillator for use in a thin tube in an

PAGE 46/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

animal body cavity has no relation with Reed or Attix. Therefore, there is no motivation for combination with Reed or Attix.

No combination of Inaba and Reed or Attix should be made. The law is replete with holdings that an Examiner may not pick elements from references and combine them without some suggestion for their combination arising in the references themselves. The decision to combine various aspects of different references would not have been a matter of "routine design choice" as suggested by the Examiner.

Kaufman has a delay line 42 in a catheter that sends electrical signals to a proximal end. Kaufman places a catheter in body lumen next to radioactively labeled regions. Kaufman has a delay line 42 in the catheter head which sends electrical signals to a signal processor outside the catheter, and thus would have lead away from the present invention even had it been combined with Reed. There is absolutely nothing in Kaufman, Reed, Attix, or Inaba that would have suggested their mutual combination in a manner proposed by the Examiner.

The Examiner has cited Bourdinaud as suggesting a second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of microlenses in the optical coupler for directing photons from a second part of the scintillator body to a second output and further comprising second optical fibers connected to the second output.

Bourdinaud has a thin plate 2 of scintillating material that receives radiation through one edge 8, and has fluorescent fibers 4 attached longitudinally along the plate. The fluorescent fibers 4 have portions 6 which are parallel, adjacent and attached to one of the two faces of the plate. The fluorescent fibers are excited by light on the plate.

Bourdinaud and Reed would have been mutually exclusive because Bourdinaud uses fluorescing cores in fibers to auto-generate wavelengths after a thin scintillator plate receives

PAGE 47/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

radiation at its end. Nothing in Bourdinaud would have suggested combination with Reed.

Even if the references were so combined, both of the references lead away from the invention as specifically set forth in the claims. Bourdinaud's fluorescent fibers, excited by light from one side of the scintillator plate, have nothing to do with Reed or Attix or with the present invention.

Nothing in the references, either singly or in combination, teaches or suggests the claimed features. Therefore, the references cannot anticipate nor render obvious the present invention as claimed.

Claim 28 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 29 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 29 adds patentable features to claim 28, which is dependent on claim 1, namely, that the optical couplers have square, polygonal, rectangular, oval or round cross-sections. This is not obvious from Reed, Attix, Inaba, Kaufman, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 30 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 30 adds patentable features to claim 23, which is dependent on claim 1, namely, that the scintillators are angularly related to an axial direction of the holder, and wherein the proximal end of each of the optical fibers is connected to at least one lateral edge of one of the

PAGE 48/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

scintillator bodies. This is not obvious from Reed, Attix, Inaba, Kaufman, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 31 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 31 adds patentable features to claim 30, which is dependent on claim 1, namely, that the plurality of independent scintillators have square, polygonal, rectangular, oval, round cross-sections, or any other combination thereof. This is not obvious from Reed, Attix, Inaba, Kaufman, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

Claim 32 is patentable over Reed in view of Attix and further in view of Inaba and further in view of Kaufman and further in view of Bourdinaud.

Claim 32 adds patentable features to claim 30, which is dependent on claim 1, namely, that the angularly related plural independent scintillators have optical connectors at opposite side edges for connecting to first and second groups of optical fibers at opposite side edges of the plural bodies. This is not obvious from Reed, Attix, Inaba, Kaufman, Bourdinaud or any combination thereof.

Nothing in the references teaches, suggests or motivates one of ordinary skill in the art to combine the references in the manner proposed by the Examiner.

PAGE 49/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

LEVEL OF ORDINARY SKILL IN THE ART

A person having ordinary skill in the art is an artisan being taught the reference teachings.

PAGE 50/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

SUMMARY

When considering the present invention as a whole and the prior art to which the invention pertains as a whole, when considering the differences between the present invention and the prior art, and when considering the level of ordinary skill in the art to which the invention pertains, it is clear that the invention would not have been obvious under 35 U.S.C. 103 to a person having ordinary skill in the art at the time the invention was made.

CONCLUSION

Reversal of the Examiner and allowance of all the claims are respectfully requested.

Respectfully,

James C. Wray, Reg. No. 22,693
Meera P. Narasimhan, Reg. No. 40,252
Matthew J. Laskoski, Reg. No. 55,360
1493 Chain Bridge Road, Suite 300
McLean, Virginia 22101
Tel: (703) 442-4800
Fax: (703) 448-7397

Date: May 5, 2005

PAGE 51/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

CLAIMS APPENDIX

Appealed Claims:

1. Fiber optic enhanced scintillator apparatus, comprising a scintillator for producing photons upon being energized by particles, energy or rays, the scintillator further comprising a scintillator body made of scintillator material, surfaces on the body for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator, and a plurality of light-conducting distinct and elongated optical fibers having a proximal and a distal end, and wherein the proximal end of each fiber is optically coupled to the photon output.

2. The apparatus of claim 1, further comprising a photon detector connected to the distal end of each of the optical fibers.

3. The apparatus of claim 2, wherein the optical fibers are long for reducing dark current.

4. The apparatus of claim 1, wherein the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator far below the earth's surface to the detector which is mounted above the earth's surface.

5. The apparatus of claim 1, wherein the scintillator further comprises an optical coupler between the scintillator body and the output.

6. The apparatus of claim 5, wherein the optical coupler further comprises an array of micro lenses for directing photons from the scintillator body toward the output and the proximal end of the optical fibers.

7. The apparatus of claim 6, further comprising a second optical coupler connected to the scintillator body remote from the first optical coupler, and a second array of micro lenses in the second optical coupler for directing photons from a second part of the scintillator body to a

PAGE 52/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729308 * CSID:703 448 7397 * DURATION (mm-ss):18-44

second output, and further comprising second multiple optical fibers connected to the second output.

8. The apparatus of claim 7, wherein the first and second outputs and each of the second multiple optical fibers have distal ends connected to a single detector.

10. The apparatus of claim 2, further comprising an electronic cooler connected to the detector.

11. The apparatus of claim 10, further comprising a magnetic field shielding surrounding the detector and the cooler.

12. The apparatus of claim 2, further comprising an electromagnetic field shielding surrounding the detector.

15. The apparatus of claim 1, further comprising a second output and first and second elastomeric optical coupler bodies connected to the scintillator body at different portions thereof for delivering photons from the scintillator body to the outputs, and for cushioning vibrations and impacts encountered by the scintillator.

23. The apparatus of claim 1, wherein the scintillator further comprises at least one additional individual scintillator body wherein each additional body is comprised of scintillator material, surfaces for directing photons toward a photon output for receiving and conducting the photons produced by the scintillator, a plurality of light-conducting optical fibers wherein each fiber has a proximal and a distal end and wherein the proximal end of each fiber is optically coupled to the photon output, and a holder for holding the scintillator bodies in an array.

24. The apparatus of claim 23, further comprising a plurality of micro lenses connected to each additional scintillator body for coupling the body to the proximal ends of optical fibers.

PAGE 53/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

25. The apparatus of claim 24, wherein the holder is flexible.

26. The apparatus of claim 24, wherein the holder is resilient.

27. The apparatus of claim 24, wherein the holder is elongated and flexible and the plural scintillator bodies are arranged axially in the holder.

28. The apparatus of claim 23, further comprising a plurality of optical couplers provided on sides of the scintillator bodies, wherein each optical coupler couples the proximal end of an optical fiber to a scintillator body.

29. The apparatus of claim 28, wherein the optical couplers have square, polygonal, rectangular, oval or round cross-sections.

30. The apparatus of claim 23, wherein the scintillators are angularly related to an axial direction of the holder, and wherein the proximal end of each of the optical fibers is connected to at least one lateral edge of one of the scintillator bodies.

31. The apparatus of claim 30, wherein the plurality of independent scintillators have square, polygonal, rectangular, oval, round cross-sections, or any other combination thereof.

32. The apparatus of claim 30, wherein the angularly related plural independent scintillators have optical connectors at opposite side edges for connecting to first and second groups of optical fibers at opposite side edges of the plural bodies.

34. Fiber optic enhanced scintillator method, comprising providing a scintillator body made of scintillator material, providing surfaces on the body for directing photons toward a photon output, providing multiple light-conducting optical fibers having proximal and distal ends, connecting proximal ends of the optical fibers to the output for receiving photons from the output, and producing photons upon a scintillator being energized by subatomic particles, energy or rays.

PAGE 54/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

35. The method of claim 34, further comprising connecting a photon detector to the distal ends of the single or multiple optical fibers.

36. The method of claim 35, further comprising providing the optical fibers as long optical fibers, and reducing dark current with the long optical fibers.

37. The method of claim 34, further comprising ruggedizing the scintillator for use far below an earth's surface, mounting the detector on the earth's surface, extending the optical fibers from the scintillator far below the earth's surface to the detector which is on the earth's surface, and transmitting photons from the scintillator through the optical fibers to the detector.

38. The method of claim 34, further comprising providing an optical coupler between the scintillator body and the output.

39. The method of claim 38, further comprising providing an array of micro lenses on the optical coupler, and directing photons from the scintillator body through the micro lenses and toward the output and the proximal ends of the single or multiple optical fibers.

40. The method of claim 39, further comprising providing a second optical coupler, and providing a second photon output on the scintillator body remote from the first optical coupler, and providing a second array of micro lenses on the second optical coupler, directing photons from a second part of the scintillator body to the second output, and providing second single or multiple optical fibers having proximal ends connected to the second output.

41. The method of claim 40, further comprising connecting distal ends of the first and second multiple optical fibers to a single detector.

43. The method of claim 35, further comprising connecting an electronic cooler to the detector.

PAGE 55/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

44. The method of claim 43, further comprising surrounding the detector and the cooler with a magnetic field shielding.

45. The method of claim 35, further comprising surrounding the detector with an electromagnetic field shielding.

55. The method of claim 34, further comprising providing plural individual scintillator bodies, providing a holder connected to the scintillator bodies, holding the plural scintillator bodies in an array, and connecting proximal ends of the single or multiple optical fibers to each of the plural individual scintillator bodies.

56. The method of claim 55, further comprising providing plural micro lens arrays on the plural scintillator bodies, and directing photons from the plural scintillator bodies through the plural micro lens arrays to the proximal ends of the optical fibers.

57. The method of claim 56, further comprising providing a flexible and resilient holder.

58. The method of claim 55, further comprising providing an elongated holder and arranging the plural scintillator bodies in an axial array.

59. The method of claim 55, further comprising providing optical couplings on sides of the plural scintillator bodies, and coupling sides of the scintillator bodies to the proximal ends of the optical fibers.

60. The method of claim 59, wherein the plural scintillator bodies are provided with square, polygonal, rectangular, oval or round cross-sections.

61. The method of claim 55, wherein the providing of the plural scintillator bodies comprises providing a plurality of independent scintillators, angularly relating the independent

PAGE 56/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

scintillators to each other, and connecting the proximal ends of the optical fibers to lateral edges of the angularly related independent scintillator bodies.

62. The method of claim 61, wherein the plural of scintillator bodies are provided with square, polygonal, rectangular, oval or round cross-sections.

63. The method of claim 61, further comprising providing optical connectors at opposite side edges of the angularly related plural scintillator bodies, and connecting the optical fibers to the optical connectors at the opposite side edges of the plural bodies.

65. The method of claim 34, further comprising connecting a detector to the distal ends of the optical fibers and cooling the detector with an electronic cooler surrounding the detector.

66. The method of claim 65, further comprising shielding the detector from magnetic fields by surrounding the detector with magnetic field shielding.

148. The apparatus of claim 1, wherein the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator below the earth's surface to the detector which is mounted below the earth's surface and at a depth that minimizes the mechanical shock and a the temperature effects on the photosensor.

149. The apparatus of claim 5, where the optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor.

150. The apparatus of claim 5, where the optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor.

PAGE 57/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

151. The apparatus of claim 24, wherein a space between the detectors is filled with an elastomer.

152. The apparatus of claim 151, where the optical coupler possesses special optical properties and can modify the light wavelength emitted from the scintillator to better match the photosensor.

153. The method of claim 34, wherein the scintillator is ruggedized for use far below an earth surface, wherein the optical fibers extend from the scintillator below the earth's surface to the detector which is mounted below the earth's surface and at a depth that minimizes the mechanical shock and a the temperature effects on the photosensor.

PAGE 58/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

EVIDENCE APPENDIX

Original application, office actions and references of record.

PAGE 59/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.

PAGE 60/60 * RCVD AT 5/5/2005 3:04:20 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/6 * DNIS:8729306 * CSID:703 448 7397 * DURATION (mm-ss):18-44